

flame within a globular opal shade, placed at such a distance that the three images of it produced by the action of the prism (the centre image formed, of course, by the superposition of two, similarly polarized) just touch each other. Two of these images are then filled (like a lantern-disk) with the complementary ring-systems; and by a very slight motion of the crystal the rings pass from a given disk to the adjacent one, becoming complementary in so doing. (It is hardly necessary to explain, for no doubt Prof. Thompson did so fully, that the whole prism is precisely

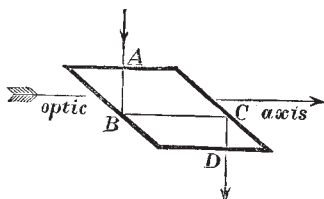


FIG. 2.

equivalent to a train of two double-image prisms with refracting angles of 45° , having between them a plate of spar with surfaces at right angles to the optic axis; a "Huyghens apparatus," in fact, with an interposed spar-plate instead of the usual selenite film.)

I may add that I have found it convenient, in order to demonstrate the principle of the prism, to divide it into halves; or, more strictly, to cut a piece of spar so as to form one half of the prism only, as shown in Fig. 3. Then, if common light from

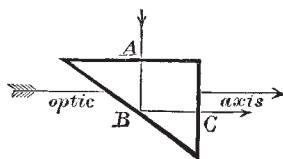


FIG. 3.

the lamp-shade (as described above) is allowed to enter the face A, and a tourmaline is held in the path of the rays emergent from C, ring-systems are seen just as when a double-image prism is used as a polarizer and a plate of spar held in front of it. Also, if plane-polarized light is allowed to enter C, and the eye is held close to A, ring-systems are seen side by side; that portion of the spar through which the rays pass after total reflection at B acting, of course, exactly as a double-image analyzer. In fact, the prism may, in this position, be used alone as a "Savart's polariscope" to detect traces of polarization in sky-light, &c. But for this application, the prism would possess, in the eyes of the true votary of science, the inestimable value of being of no practical utility whatever.

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H. G. MADAN.

Coral Reefs, Fossil and Recent.

DR. VON LENDENFELD'S account of the dolomites of the Italian Tyrol, in his letter on "Coral Reefs, Fossil and Recent," is a very valuable contribution to this interesting question; but I think he can hardly have fallen in with the new edition of Darwin's "Coral Reefs," or he would not have asserted that in the discussion "the structure of our Triassic limestone mountains has been left out of account." In the appendix (p. 332) I wrote:—"If those geologists are right who consider the Schlern dolomites as being to a great extent due to reef-building corals, we have, in the Triassic deposits of the Italian Tyrol, reefs thick enough to satisfy the most exacting requirements." I could not venture upon a more positive statement, because I knew controversy on this question was not ended, and I had not myself, though fairly familiar with the "Dolomites," discovered evidence which appeared to me conclusive (though I incline to the above opinion myself), and because I considered that the view advanced several years since by Richthofen required some modification—indeed, as to one detail, if I understand him rightly, I should differ from Dr. von Lendenfeld.

I am confirmed in my idea that he has not read this book, because I find that one of his chief arguments—that against the indefinite lateral extension of a coral reef on a talus of its own building—appears to correspond with one advanced by myself on p. 327, differing only in the addition of an arithmetical example;

one of which, indeed, I did work out, but afterwards suppressed as needless, the truth of the statement being obvious when it was once pointed out.

T. G. BONNEY.

Bison and Aurochs.

IN regard to Prof. Newton's letter in your issue of the 8th, I beg to state that in restricting the name aurochs to the European bison, I have merely followed the general custom of English zoologists.

Citing a few authorities, I may first make the following extract from a paper by Prof. W. B. Dawkins, published in the Quart. Journ. Geol. Soc., vol. xxii. p. 394 (1866). There, after alluding to the Indian gaur, this author writes, "the term *Aurochs* has been restricted to the European bison by the authority of Buffon, Cuvier, and Prof. Owen; the term *Urox* or *Bos urus*, to the species under consideration [the extinct wild ox of Europe] by Julius Cæsar, Pliny, . . . also by Cuvier, Nilsson, and our great naturalist, Prof. Owen."

Again, in the article on Ruminants by the late Prof. Garrod in "Cassell's Natural History" (2nd ed., p. 35), the term aurochs is applied to the European bison. Finally, we find in Prof. Flower's "Catalogue of Mammalia in the Museum of the College of Surgeons," p. 232 (1884), the animal in question mentioned as the *European Bison* or *Aurochs*.

I find, however, that modern German zoologists (see Brehm's "Thierleben," vol. iii. p. 386) consider it proved that the name *Aurochs* belongs properly to the extinct *Bos primigenius*; and they term the bison, as Prof. Newton states, the *Wisunt*. If this be really correct, English zoologists must accept the emendation.

R. LYDEKKER.

The Lodge, Harpenden, Herts.

The Haunts of the Gorilla.

CONCERNING Mr. Du Chaillu's saying (see NATURE, May 1, p. 19) "that, so far as he is aware, no white man has been able since his time to penetrate to the haunts of the gorilla and bring home specimens killed by himself," I beg to remark that Herr von Koppenfels, in the years 1873-80, killed personally a number of gorillas in the environs of the Ogowé, and sent 3 large specimens, with their skeletons, to the Dresden Museum, some of which I described in the *Mittheilungen aus dem königl. zoologischen Museum zu Dresden*, vol. ii. 1877, p. 230 seq. The Museum in Stuttgart also contains several specimens killed by that intrepid traveller; and other museums, I believe—American museums, for instance—possess some. (See also his remarks in the *American Naturalist*, vol. xv. p. 447; and *Die Gartenlaube*, 1877, p. 416 seq., with plate; as well as mine in *Der zoologische Garten*, 1881, vol. xxii. p. 231.) Herr von Koppenfels, who died in the year 1884 in Erfurt, in consequence of diseases acquired in the tropical climate, says (*l.c.*) that the haunts of the gorilla in West Africa are in the forests between the mouths of the Mimi and the Congo Rivers, *i.e.* between 1° N. lat. and 6° S. lat. How far the region extends into the interior is even yet unknown.

A. B. MEYER.

Royal Zoological Museum, Dresden, May 7.

Flat-fishes.

MR. GULICK, in NATURE, vol. xli. p. 537, has raised a puzzling point about the flat-fish. In the case of his two Japanese species, it might appear that the ancestor of them both varied in the two directions as to the position of its eyes, &c., and that by the segregation of each form, *neither of which had any advantage over the other*, two species eventually were evolved. But this is not so clear in other cases, apparently. On the American coast of the Pacific, there is a flat-fish, *Paralichthys californicus*, Ayres, which is said by Messrs. Jordan and Goss to be almost as frequently dextral as sinistral. Here, then, is the same sort of variation exactly, yet we see no evidence of segregation and the formation of new species. In the whole sub-family *Soleinæ*, the eyes and colour are on the right side: now, if the "dextral" soles segregated themselves, having no advantage in being dextral rather than sinistral, what has become of all the sinistral ones? If there was no natural selection at play, ought we not to get some sinistral species of *Solea*? Perhaps it may be said that *Solea*, as such, never varied in this way, and was always dextral. But this cannot be so, since we have it on Day's authority that the common sole has a reversed aberration. But, after all, the allied *Cynoglossinæ* are sinistral soles.

Taking the *Pleuronectidae* as a whole, we certainly get a division into dextral and sinistral groups, which might be supposed to be the result of a "like to like" segregation at an early period. The following table of the sub-families, compiled from Messrs. Jordan and Goss's excellent work on these fishes, illustrates the point:—

- (1) *Hippoglossina*: normally dextral, except the tropical species, which are sinistral.
- (2) *Pleuronectina*: sinistral flounders.
- (3) *Oncopterina*: dextral.
- (4) *Platessina*: dextral, but *Platichthys stellatus* is frequently sinistral.
- (5) *Soleina*: dextral soles.
- (6) *Cynoglossina*: sinistral soles.

But how comes it that the tropical flounders are nearly all sinistral, while the Arctic and Antarctic ones are chiefly dextral?

It would be interesting to know more of the reversed aberrations which occur. *Platessa flesus* var. *passer* (Linn.) is a reversed form, and Day records reversed aberrations of *Solea solea*, *Pleuronectes rhombus*, and *P. maximus*, while others have been noted by various writers. T. D. A. COCKERELL.

West Cliff, Custer Co., Colorado,
April 25.

Variation in the Nesting-Habits of Birds.

IN connection with T. D. A. Cockerell's letter, *re* the nesting-habits of the blackbird in Colorado, it may be of interest to note that in the grounds around our residence about a fortnight ago, I discovered the nest of a blackbird (*Merula vulgaris*) built upon the ground close to a boundary wall about five feet high. The bottom of the nest is resting on the ground, but there is some trailing ivy growing around—but not on the wall—which supports it at sides and partially obscures it. There is a public road on the other side of the wall and the noise of considerable traffic. There are many suitable trees, bushes, and shrubs, all around, some of which have been utilized by other blackbirds—indeed, there is a tree within a few feet of the nest, which would have been suitable but for the chances of observation from the road. THOS. SWAN.

Bankplace House, Leslie, Fifeshire, Scotland, May 7.

Doppler's Principle.

IN answer to a correspondent who has met with a difficulty in the consideration of Doppler's principle, I may say that I think I fairly solved the difficulty in a paper delivered last year before the University College Chemical and Physical Society. In cases (1) and (2) of your correspondent, viz. approach or recession of observer, source and medium being at rest, the correct formula is $n' = n \frac{a \pm v}{a}$; and in cases (3) and (4), viz. approach and recession of source, observer and medium at rest, it is $n' = n \frac{a}{a \mp v}$.

n' = the new, and n the old frequency of vibration of the note heard. It should be remarked, however, that in all practical cases, the two formulæ give very nearly the same result; but if the velocity v is very great, the case is entirely different. Suppose, for instance, in cases (1) and (2) that v = velocity of sound a , then $n' = 2n$ for approach, and 0 for recession of the observer. The correctness of these results is obvious without the aid of any formula. Again, in cases (3) and (4) suppose $v = a$, then $n' = \infty$ for approach, and $\frac{n}{2}$ for recession of the source of sound. The effect of an infinite number of waves striking the ear at the same moment would be simply that nothing would be heard. It would be interesting to notice the change in pitch of the whistle of a rifle-bullet passing near an observer. Ganot's formula is correct for cases (1) and (2), and Prof. Everett's for cases (3) and (4); the proofs are very simple, and may be easily thought out. When the observer and the source of sound both move, the two formulæ should be applied separately when a very accurate result is desired. These conclusions have been confirmed by Dr. Fison, of University College. I had not considered the effect of the motion of the medium, but it appears to me, after a little reflection, that this would increase or diminish the velocity of the sound, and the wave-length, in the same proportion, leaving the pitch unaltered; the velocity of the medium should therefore be added to or subtracted from a in the formula.

University College, May 5.

E. P. PERMAN.

"Index Generum et Specierum Animalium."

NATURALISTS have long needed a reference book to the names of genera and species. Such a want has already been partially supplied by Agassiz, Bronn, Morris, Marshall, Scudder, Waterhouse, and others—only Bronn and Morris having attempted palæontological species—but no one book including references to all names given to living and fossil animals has yet been attempted. Botanists, more fortunate, will soon possess Daydon Jackson's index to flowering plants. The idea has therefore suggested itself to me to begin at the end of June next, such an "Index Generum et Specierum Animalium," taking the following rules for guidance:—

(1) The earliest reference is to date from the twelfth edition of Linnæus, 1766.

(2) The last reference to close with December 31, 1899.

(3) The names of genera and species to be given in a single alphabetical sequence, and accompanied by a reference to the original source.

(4) The names of species of each genus to be also quoted in alphabetical order under that genus.

(5) No attempt at synonymy to be given; but, to assist reference, the various genera in which a species has from time to time been placed, to be indicated under that species.

(6) Pre-Linnæan names to be quoted as founded by the author first using them after 1766:—*e.g.* *Echinocorys*, Leske, 1778 (*ex* Klein, 1734). Should a pre-Linnæan species or genus have been re-named after 1766, before the post-Linnæan use of that pre-Linnæan name, the new name is to stand. [References will be given to Artdi, Brisson, and Scopoli, in accordance with British Association rules.]

Among the many offers of assistance, that of Prof. Flower, F.R.S., Dr. Günther, F.R.S., and Dr. Henry Woodward, F.R.S., who have promised the necessary space for the storage of the MS. in the Natural History Museum, is most valuable, as it practically ensures safety from fire, and renders the MS. easily accessible to those wishing to consult it while still imperfect.

The contribution of inaugural addresses, theses, or other publications difficult to obtain, would be of great assistance; and, after use, such pamphlets would be handed over to the library at the Museum.

Any suggestions for the improvement of this plan, before the commencement of the undertaking, would be gladly received and carefully considered.

Appended is a rough outline of the scheme:—

[cordatus -a, -um]	
Amphidetus (Penn.) Düb. and Koren, Zool. Bid. 285	1844
[v. Echinus]	
Amphidotus (Penn.) E. Forbes, Brit. Starf. 190, fig.	1841
[v. Echinus]	
Echinocardium (Penn.) J. E. Gray, Cat. R. Ech. 43	1855
[v. Echinus]	
Echinus, Pennant, Brit. Zool. iv. 58, xxxiv. 2, xxxvi. 2	1777
[v. also Amphidetus, Amphidotus, Echinocardium, Spatangus]	
Spatangus (Penn.) Flem. Brit. Anim. 480	1828
[v. Echinus]	
Cordia, Stål, Hem. Afric. iv. 78 Hem. 1866	
[albilateralata, peragrans.]	
Cordienia, A. Rouault, B. S. géol. France, v. 207.. Gast. 1848	
[biariziana, iberica, palensis, pyrenaica, all nom. nud.]	

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"The Anatomy of the Frog."

IN your notice of the above work, in NATURE of the 8th inst., you are pleased to express a favourable opinion of the wood engravings. As the heading of the article might lead your readers to imagine that these, in addition to the coloured plates, were all executed by Hofmann, of Bavaria, I think they, as well as yourself, will be pleased to know that all the *new* blocks, numbering upwards of one hundred, were engraved by

172 Strand, London.

T. P. COLLINGS.